Name _____Period _____

Sandwich Stoichiometry

Your Tasks (Mark these off as you go)

- ☐ Explore stoichiometry sandwiches
- ☐ Explore the stoichiometry of chemical reactions
- ☐ Test your understanding
- ☐ Receive credit for this lab

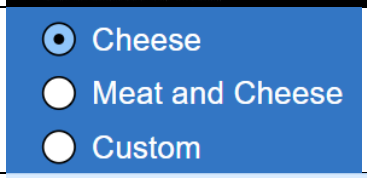
❑ Explore stoichiometry sandwiches

Part 1. Cheese Sandwiches

Go to the PhET simulation website:
https://phet.colorado.edu/sims/html/reactants-products-and-leftovers/latest/reactants-products-and-leftovers_en.html

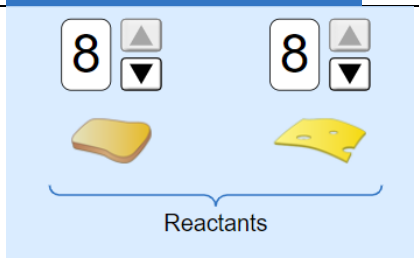
And select "Sandwiches"

Make sure the "Cheese" option is selected



Use the arrows to enter the following under the reactants on the left ("Before Reaction"):

Before Reaction
8 pieces of bread
8 pieces of cheese



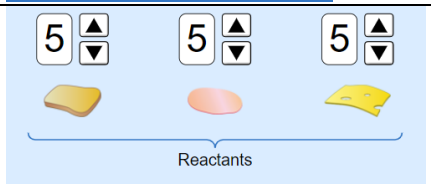
Record the amounts of products, and the amounts of leftovers in the Part 1 Data Table below.

Complete Part 1 Data Table for the amounts indicated.

Reactants	
	
8	8
5	8
4	8
6	3

Part 1 Data Table: Cheese Sandwiches				
Reactants		Products	Leftovers	
				
8	8			
5	8			
4	8			
6	3			

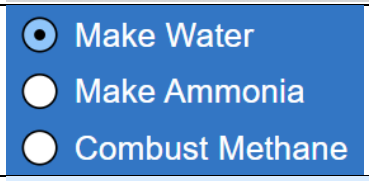
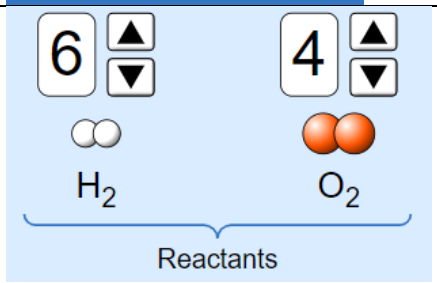
For which conditions were there no leftovers? What is ratio of bread to cheese for this condition?
Based on the ratio above, write balanced reaction for making cheese sandwiches.

Part 1. Meat & Cheese Sandwiches	
Select "Meat and Cheese" at the top	
Use the arrows to enter the following under the reactants on the left ("Before Reaction"): **Before Reaction** 5 pieces of bread 5 pieces of meat 5 pieces of cheese Record the amounts of products, and the amounts of leftovers in the Part 2 Data Table below.	
Complete Part 2 Data Table for the amounts indicated.	**Reactants** 5 / 5 / 5 8 / 3 / 4 8 / 4 / 4

Part 2 Data Table: Meat & Cheese Sandwiches						
Reactants				Leftovers		
						
5	5	5				
8	3	4				
8	4	4				
3	2	1				

For which conditions were there no leftovers? What is ratio of bread to cheese to meat for this condition?
Based on the ratio above, write balanced reaction for making meat & cheese sandwiches.

❑ Explore the stoichiometry of chemical reactions

Part 1. Stoichiometry of making water	
Select the "Molecules" option at the bottom of the page.	
Select the "Make Water" option.	
Use the arrows to enter the following under the reactants on the left ("Before Reaction"): **Before Reaction** 6 H_2 4 O_2 Record the amounts of products, and the amounts of leftovers in the Part 1 Data Table below.	
Complete Part 1 Data Table for the amounts indicated.	**Reactants** H_2 | O_2 8 | 8 5 | 8 4 | 8 6 | 3

Part 1 Data Table: Stoichiometry of water				
Reactants		**Products**	**Leftovers**	
H_2	O_2	H_2O	H_2	O_2
8	8			
5	8			
4	8			
6	3			

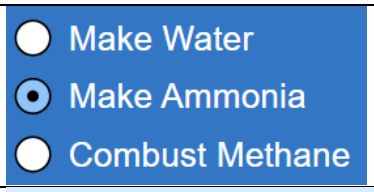
For which conditions were there no leftovers? What is ratio of hydrogen to oxygen for this condition?

Based on the ratio above, write balanced reaction for making water.

How much hydrogen and oxygen is needed to make exactly 4 water molecules with no leftovers?

Part 2. Stoichiometry of making ammonia

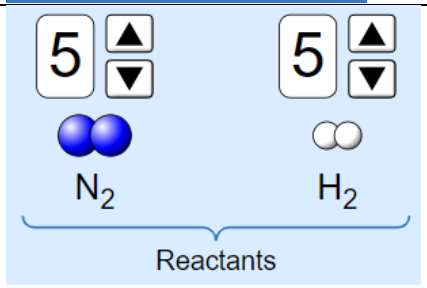
Select the "Make Ammonia" option.



Use the arrows to enter the following under the reactants on the left ("Before Reaction"):

Before Reaction
5 N_2
5 H_2

Record the amounts of products, and the amounts of leftovers in the Part 2 Data Table below.

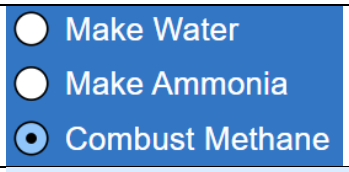
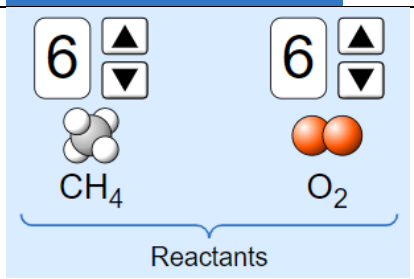


Complete Part 2 Data Table for the amounts indicated.

Reactants	
N_2	H_2
5	5
6	3
3	6
2	6

Part 2 Data Table: Stoichiometry of ammonia				
Reactants		**Products**	**Leftovers (Excess)**	
N_2	H_2	NH_3	N_2	H_2
5	5			
6	3			
3	6			
2	6			

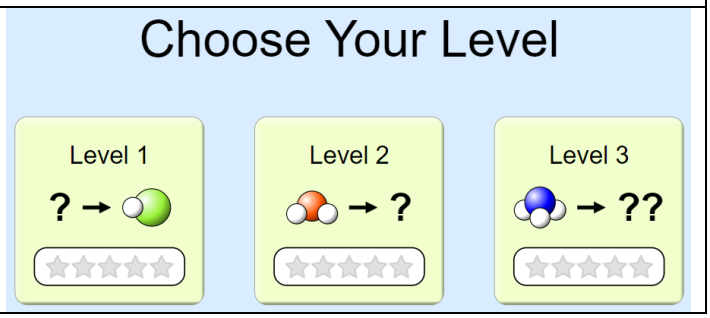
For which conditions were there no leftovers? What is ratio of nitrogen to hydrogen for this condition?
Based on the ratio above, write balanced reaction for making ammonia
How much nitrogen and hydrogen is needed to make exactly 2 ammonia molecules with no leftovers?

Part 3. Stoichiometry of the combustion of methane	
Select the "Combust Methane" option.	
Use the arrows to enter the following under the reactants on the left ("Before Reaction"): **<u>Before Reaction</u>** 6 CH_4 6 O_2 Record the amounts of products, and the amounts of leftovers in the Part 3 Data Table below.	
Complete Part 3 Data Table for the amounts indicated.	

Reactants	
CH_4	O_2
6	6
6	4
2	4
3	7

Part 3 Data Table: Stoichiometry of the combustion of methane					
Reactants		**Products**		**Leftovers (Excess)**	
CH_4	O_2	CO_2	H_2O	CH_4	O_2
6	6				
6	4				
2	4				
3	7				

❑ Test your understanding

Navigate to the Build an Atom game https://phet.colorado.edu/sims/html/build-an-atom/latest/build-an-atom_en.html	
Play levels 1, 2, and 3. Once you have completed all four levels, take a screenshot of your results and paste it below.	

Paste a screenshot of your game results below.

❑ Receive Credit for this lab

Each group member must complete and submit their own lab to receive credit